FORD MOTOR COMPANY—WIXOM ASSEMBLY PLANT HYDROGEOLOGIC INVESTIGATION

Ву

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October 1987

TABLE OF CONTENTS

P	age
Introduction	1-2
Geology	2-4
Investigation .	
Site #1	4-6
Site #2	6-7
Site #3	7
Results	7-14
LIST OF TABLES, FIGURES, & APPENDICES	
figure p	age
Site Map	cket
Glacial Geology Map	3
Piezometric Surface Contour Map & Ground Flow Directions 3	
	10
Approximate Limits of Sludges & Foundry-type Sands in Site #34	10 13
Approximate Limits of Sludges & Foundry-type Sands in Site #34	13
	13
appen	13 dix

FORD MOTOR COMPANY-WIXON ASSEMBLY PLANT

In June and July of 1987, the Hydrogeologic Section of the Environmental Response Division (ERD), Michigan Department of Natural Resources (MDNR), responded to a request by the Detroit District Environmental Response Division staff to participate in a field investigation at Ford Motor Company's Wixom Assembly Plant. In mid 1986, drums containing hazardous materials were uncovered during construction of an on-site wastewater treatment facility and raised concerns about reports that other hazardous materials were buried within the plant property.

The purpose of the investigation was to confirm the presence of purported buried wastes by (1) identifying their location(s) through the use of geophysical methods and correlation borings, (2) by collecting and analyzing soil samples of questionable materials, and (3) by collecting and analyzing groundwater samples to determine whether hazardous materials were causing groundwater contamination.

A field visit to the plant was made by MDNR personnel in June of 1987 to evaluate site conditions as they related to the goals of the investigation. The area was inspected for locations of overhead and underground utilities, buildings, roads, lagoons, surface topography, etc. The site (Figure 1; 2 sheets) was divided into three separate areas, each having a specific investigative goal.

Site #1 consists of a landfill of approximately 25 acres in size. In this area, the goal was to determine whether local groundwater quality was impacted by the landfill. This was accomplished by installing several nonitor wells at specific depths and locations, as necessary, around the perimeter of the landfill. Groundwater was sampled from these wells by District staff and analyzed for selected parameters by the MDNR Environmental Laboratory.

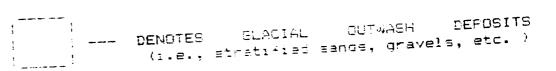
Site #2 consists of a rectangular area approximately 1000 feet x 400 feet. In site #2, an EM survey was conducted throughout the area to define sites of anomalous electrical conductivities. These anomalous areas, contrasting with background conductivities, were further investigated by collecting continuous split spoon core samples from the ground surface to an unaffected depth. Questionable materials collected during the sampling process were analyzed by the MDNR Environmental Laboratory for selected parameters. If a saturated zone was encountered during the sampling, a temporary well would be installed to collect a water sample for analysis by the laboratory.

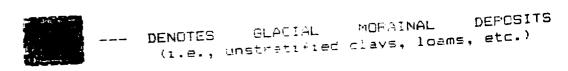
Site #3 consists of a triangular area approximately 300 feet x 350 feet x 150 feet. During construction of footings for an overhead trestle system, questionable sludge materials were uncovered. An intensive soil boring and split spoon sampling program will be conducted to define the horizontal and vertical extent of the sludges. If a saturated zone was encountered during the sampling, a temporary well would be installed to collect a water sample for analysis.

GEOLOGY

Wixom is situated in a diverse geologic setting. The surface and near surface features are a result of several periods of glaciation, most likely the result of the most recent which ended approximately 10,000 years ago. Many landforms are located in the area, ranging from lakes and swamps to level plains and rolling hills. All types of soils exist, from sands and gravels to clays and mucks. As can be seen by a review of a glacial geologic map of the area (Figure 2), the Wixom area lies in a outwash channel directly west of two parallel morainal ridge These moraines represent the margins of glacial ice and formations. are composed of medium to coarse grained sands, gravels, clays, and loams randomly deposited when glacial ice was at a standstill. Between these ridges and directly adjacent to them are outwash deposits consisting of stratified sands, silts, and gravels. These deposits were created as a result of sedimentation from soil laden glacial melt waters.







Specifically, the Ford Assembly plant is situated on both outwash and morainal deposits. Near surface soils consist of clays, silts, loams, sands, and gravels, and combinations of some or all of the above. Most of the outwash deposits occur in layers ranging from a few inches to a few feet in thickness. Not all layers are continuous throughout the area and may not even exist in others. The morainal materials are randomly deposited and exhibit no specific vertical or horizontal features. The combination of outwash and morainal deposits in the plant area contribute to complex groundwater flow patterns.

INVESTIGATION -- SITE #1

In Site #1, a total of 9 wells were installed (Figure 1). Previous conducted indicated studies within the plant property groundwater flow direction. north-northwesterly Assuming information is correct, three to four of the wells can be considered upgradient of the landfill and the remainder as downgradient. wells were screened in saturated zones as determined by drilling to an approximate depth of 25-30 feet. Three of these upgradient wells are located immediately southeast of the fill, and the fourth well is located west-southwest of the fill. All of these wells were completed with the screen section in the saturated zone nearest the ground None of the wells were developed with the exception of monitor well #1.

All drill cuttings were placed in 55 gallon drums provided by Ford Motor Company pending hazardous waste characterization, with the exception of monitor well #1. This well was completed and developed prior to the request to drum all drill cuttings and fluids. Characterization of materials for the presence of hazardous materials would determine the methods of dealing with borehole materials and future development waters.

A total of five wells were installed at four locations downgradient from the landfill. These wells were located along the north and northwestern sides of the landfill. Each well was completed in the saturated zone nearest the ground surface with the exception of monitor well #4D. This well was screened in a lower zone of saturation to establish a sampling point for monitoring groundwater quality in the lower zone.

Care was taken to prevent any connection between saturated zones in the event that either one or all were contaminated. This was accomplished by grouting the entire length of the borehole except in the immediate vicinity of the screened interval. Grouting consisted of pumping an expansive bentonite slurry down the borehole through the center of the in-hole hollow stem augers. As the level of the grout was elevated to the surface, augers were pulled from the borehole, permitting the bentonite slurry to flow into the borehole from the bottom of the augers. This insured an effective seal between different zones within the borehole. A cemented zone at the top of each borehole provided a seal against any surface induced contaminant from entering the borehole. Each well was equipped with a locking vented cap for security. See Appendix B for individual well logs.

All augering equipment was thoroughly steam cleaned prior to use and after each installation to prevent any contamination or cross contamination from impacting the wells.

All the monitor wells were vertically gamma ray logged. Gamma ray logging is a borehole geophysical technique used in interpreting the vertical lithologic distribution of soils in the immediate vicinity of the borehole. Gamma ray logging measures the total amount of naturally occurring gamma radiation, in counts per second, within soils caused by the presence of uranium, thorium, and potassium. Generally, clay and silt materials, which act as hydrologic barriers, are more radioactive than sands and gravels.

Gamma logging is conducted by lowering and raising a cylindrical gamma radiation measuring probe inside the well. The instrument is calibrated, with respect to the total range of radioactivity present, as it is lowered into the well and a record of the hole collected as the probe is elevated at a specific rate of speed.

INVESTIGATION-SITE #2

In site #2, an electromagnetic (EM) conductivity survey utilizing a Geonics EM-31 instrument was conducted by DNR geologist Kevin Kincare. Sharon A. Mason, Ford Motor Company hydrogeologist, assisted in this survey.

The EM-31 is a geophysical instrument which utilizes two electrical coils to induce and measure an electromagnetic field. A transmitter coil induces an electromagnetic field into the ground and a receiver coil measures the resultant current field which is directly proportional to the ground conductivity. This instrument is useful in delineating areas of buried metallic objects or extraneous fluids having conductivities contrasting with background levels. This instrument has a fixed intercoil spacing of 3.7 meters for an effective depth of exploration of approximately 6 meters.

Ground conductivity is dependent on the ionization characteristics of the soil. It is also dependent on the fluid content and type. For instance, quartz sand has few unsatisfied electrical bonding sites in its chemical structure and, therefore, exhibits low conductivity. Clay minerals have net electrical charges (many bonding sites) and resultant high conductivities. Water with low levels of dissolved solids have few ions in solution, a low ionization potential, and low conductivities. Increasing the amount of dissolved solids, therefore, increases the conductivity. Metals are characterized as having shared electrons that are easily ionized and as such, metals, especially ferrous metals, have very high conductivities.

For this survey, a point at the extreme northern end of the plant property—X-1525, Y-2475—was chosen for calibrating the EM-31. This point and the surrounding area north of the ditch had a relatively uniform conductivity of 13 mmhos/meter.

The total area which could be effectively surveyed within site #2 was somewhat limited by the presence of metallic construction materials (cultural interferences) stored about the site. However, several clear lines were surveyed. Refer to Figure 1 for locations of the EM data points.

Two areas were discovered, one having conductivity values approximately twice as high as background and another having values approximately 10-15 times background. These areas were cored by the split spoon method and samples collected for analysis when questionable materials were encountered. Additional borings were conducted in background areas for the purpose of correlation to the EM survey.

INVESTIGATION-SITE #3

In site #3, a total of 10 borings were conducted (Figure 1). Each boring was conducted by progressively advancing a two foot split spoon sampler ahead of the auger string. Continuous samples were collected at two foot intervals from the surface to an unaffected depth. When questionable materials or saturated zones in the immediate vicinity of the questionable material were encountered, a sample was collected for laboratory analysis. Each boring was either backfilled with a expansive bentonite slurry or with the borehole cuttings depending on the geologic conditions present. See Appendix 2 for individual boring logs.

INVESTIGATION RESULTS

In site #1, the three upgradient wells depict a multi-layered pattern. This pattern consists of a brown to grey loamy clay layer from the surface to approximately 3 feet below grade. From 3-7 feet, there are sands & loams, from 7-12 feet are clays & loams, from 12-15 feet are sandy zones, from 15-25 feet are loams & clays, and from 25 feet to the

bottom of the borehole are predominantly sands & gravels with substantially less clays than the above layers. The extent, depths, and thicknesses of these layers vary from well to well. The remaining monitor wells downgradient of the landfill also depict a multi-layered pattern. This pattern consists of a fairly thick (3-5 feet) layer of black top soil overlying a 4 feet thick saturated grey silt to sand layer. These layers are above a 10-12 feet thick brown and grey silty clay layer having a minor (1-2 feet) thick silty sand layer within it. This silty sand layer in some instances is saturated. Below this are saturated silty grey sand and gravel layers (20-27 feet below grade) interbedded with thin (less than 1 foot) layers of silty clay.

The silty clay layers from approximately 9-20 feet below grade appear to diminish in thickness and lateral extent to the west. In monitor wells #5 & #7, the layers are less predominant and are replaced by more sand and gravel materials.

Generally, it could be inferred that a similar multi-layered pattern existed in the landfill area. Prior to its existence, the area was likely as follows: from the surface to an approximate depth of 5 feet was top soil, from 5 feet to approximately 10 feet was a sand and gravel layer, from 10 feet to approximately 21 feet was a silty clay layer interbedded with minor sand lenses, from 21 feet to 25 was saturated silty sands and gravels, and from 25 feet-? was silty clays.

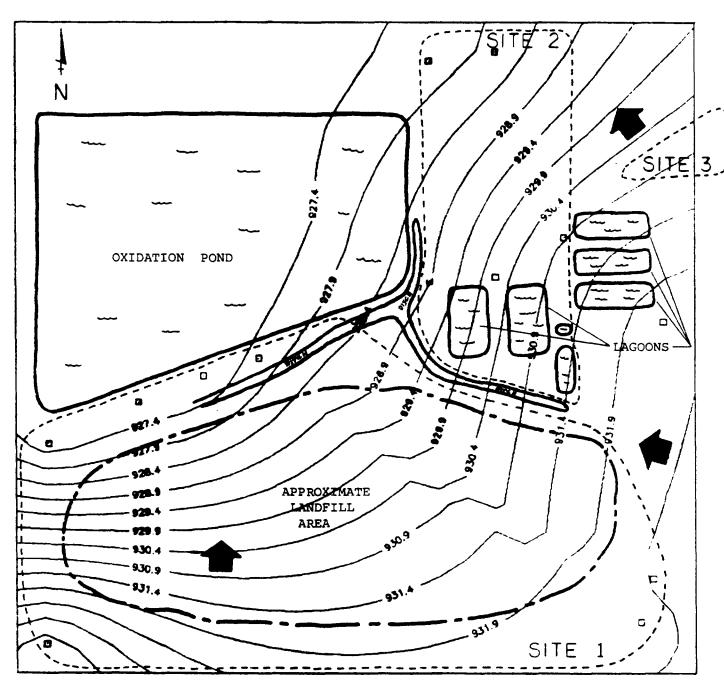
Because of the potential hazards, no drilling was conducted within the landfill. Therefore, no positive connection or correlation of layers was determined. Certainly, the upper 5-10 feet of soil has been disturbed by the landfill operations. The lower sand and gravel layers may be acting as possible conduits to fluid movement, depending on the depth of the landfill cut and the lateral and vertical extent of the clay deposits.

After all monitor wells were installed and allowed to equilibrate, a static water elevation was measured in each well. Comparison of the static water elevations to the geologic cross-sections indicate confined aquifer conditions and, therefore, the elevations are indicative of a piezometric surface as compared to a water table surface. This data was used to determine the piezometric surface configuration for the area and a contour map (Figure 3) prepared which graphically shows the surface and the local groundwater flow direction. Analysis of the map indicates that groundwater is flowing in a north to northwest direction depending on location and confirms the flow direction determined from previous studies. There does not appear to be any groundwater mounding in the vicinity of the landfill which could infer its geologic isolation from the surrounding area.

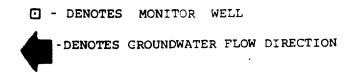
In site #2, the electromagnetic (EM) survey was conducted in all areas where no cultural interferences existed (Figure 1) and a statistical analysis of the data performed. From a total of 821 points, the highest value was 140 mmhos/m and the lowest point was 0.7 mmhos/m. The sample mean was 33 mmhos/m with a mode of 19 mmhos/m which indicates an uneven distribution. Sample skewness of 1.3 indicates a strong imbalance toward lower values. The kurtosis value of 3.8 shows an extreme degree of clustering of data values around the mean. The standard deviation of the sample population is 28. Values above 100 mmhos/m are, therefore, 2.39 standard deviations from the mean. There is a 98% chance that values greater than 100 mmhos/m are anomalous.

The majority of survey lines indicated no electromagnetic anomalies and had values ranging from 10-20 mmhos/meter. Three measurements of sludges generated at the plant were taken in the dewatered half of an oxidation pond on site to determine if they might have any impact on ground conductivities. Two measurements of 11 mmhos/m and one measurement of 12 mmhos/m indicate that the sludges would not cause any electromagnetic anomalies. There is a strong anomaly, however, in the southeastern portion of the site. This anomaly extends radially about 20 feet from the point at X-1735, Y-1555. The highest measurement of conductivity (140 mmhos/m) occurred at X-1735, Y-1535 with 30 adjacent

FIGURE 3



PIEZOMETRIC SURFACE and GROUNDWATER FLOW DIRECTIONS



points having values in excess of 100 mmhos/m. Two correlation soil borings (#12 & #13) were conducted in this area to determine the source of the anomaly. From approximately 1-5 feet below grade, a black greasy sand and gravel mixture containing melted metallic materials was found.

This material appears to be some type of foundry sand and is likely the cause of the anomalous EM readings because of its composition and proximity to the surface. Below this layer, clay deposits were found to an approximate depth of 10-11 feet. No borings within this anomalous area were extended below this depth. Soil boring #12 was abandoned by grouting the entire length of the borehole with an expansive bentonite slurry because of the saturated zone at 10-10.5 feet below grade. Soil boring #13 was abandoned by backfilling the hole with compacted borehole materials.

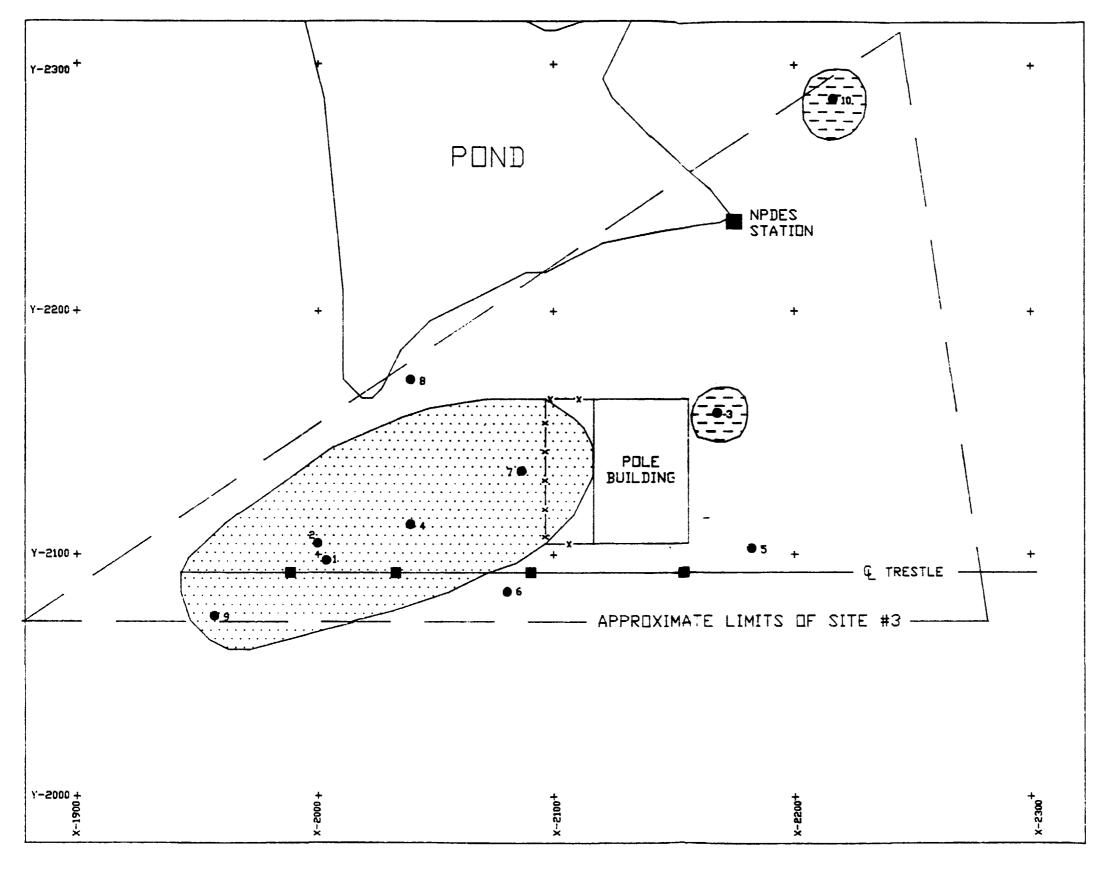
A correlation soil boring (#11) at station X-1745, Y-1940 was conducted in the area having EM values approximately double that of background. Three feet of gravel overlies clay deposits of at least 11 feet in thickness. No questionable materials were found in this boring. The borehole was abandoned by backfilling with compacted borehole materials. The slightly elevated EM values in this area are likely attributable to scattered scrap metal near the surface, the composition of the gravel, or to the amount and extent of clay found in the boring.

A correlation soil boring (#14) was conducted at the extreme northwestern corner of the plant property. In this boring, a soft red cohesive loamy layer was found from approximately 1-2 feet below grade. Below this layer was clay interbedded with thin (less than 1/2 feet thick) sand lenses. A sample of this red loamy material was collected for analysis and the borehole abandoned. A final correlation boring (#15) was conducted at X-1668, Y-2100, a randomly chosen location. This boring consisted of mostly silty clay deposits interbedded with thin lenses of clay loams. No questionable materials were discovered in this boring and the hole was abandoned.

In site #3, five of the ten borings revealed the presence of sludge materials. This sludge was black in color, had a tar-like consistency, and was found in a zone ranging from 4-7 feet in depth. In soil boring #7, the sludge was found from approximately 5-9.5 feet below grade. Several samples of this material were collected for laboratory analysis. In soil boring #2, the sludge had a sandy texture and was saturated. A temporary well was installed and a water sample collected from this boring.

Two of the remaining borings revealed the presence of black foundry-type sand and gravel. Melted metallic materials were present in these soils indicating a non-natural origin. Figure 4 is an enlargement from Figure 1 of the area where these sludges and questionable materials were found and delineates their approximate lateral extent.

In soil borings where the tar like substances were found, all questionable materials were stored in 55 gallons drums. All of the soil borings in site #3 were abandoned in a manner dependent on the geologic conditions present. If any saturated zones were encountered at any depth within the boring, the entire borehole was filled with an expansive bentonite slurry. If no saturated zones were encountered, the borehole was backfilled with compacted borehole materials. Throughout sites #2 & #3, all of the soil borings consisted of interbedded sand and clay deposits. The predominant soil was clay. It appears that these clays were both till and swamp deposits. The till clays were quite silty, dry, and contained a mixture of pebbles of varying sizes. The swamp deposits contained organically decaying roots and twigs and contained shells of simple organisms in a clay matrix.







- -- SOIL BORING
- -- TRESTLE PAD



FOUNDRY-TYPE SAND



SLUDGES

FIGURE 4

APPROXIMATE LIMITS OF SLUDGES & FOUNDRY-TYPE SANDS IN SITE #3

On July 22 and 23, 1987, all of the monitor wells were sampled for analysis by the MDNR Environmental Laboratory and the Ford Motor Company laboratory. Each well was developed by the surge block method for a limited period of time. The amount of time that each well was developed was either (1) until a 55 gallon drum was filled, (2) until development water was clear, (3) or it was believed that the development water was representative of the aquifer zone in which it was screened. The development water from each well was collected into 55 gallon drums provided by Ford Motor Company, pending chemical analysis.

A complete listing of all samples collected and their locations is included in this report (Appendix A). All of the monitor well logs and gamma ray logs (Appendix B) and soil boring data (Appendix C) are included in this report. Actual EM field data is available on request.

APPENDIX A

SAMPLES COLLECTED FOR LABORATORY ANALYSIS

FORD WIXOM

SITE #3 (Trestle Area)

Test Boring Locations #1 - #10

Sample Collection Locations

SOILS:

TB-1 (6 ft. depth) -- Black Sludge Material 07/1/87 12:30

TB-4 (7-1/2 ft. depth)--Black Sludge Material 07/02/87 14.10

TB-4 (11-13 ft. depth)--Clay Beneath Sludge 07/02/87 14:30

TB-5 (4-6 ft. depth)--Gray Silty Clay (greasy) 07/14/87 14:25

TB-6 (4-6 ft. depth)--gray discolored clay 07/14/87

TB-6 (7 ft. depth) -- Reddish Black Sludge 07/14/87 15:40

TB-7 (9-1/2 ft. depth)--Reddish Black Sludge 07/15/87 10:20

TB-10 (2-4 ft. depth)--Black Foundry Type Material 07/16/87 11:15

WATER

TB-2 (6 ft.)--GW from Black Sludge Zone 07/01/87 13:40

TB-9 (10-12 ft.)

15:05 07/15/87

TB-10 (10-12 ft.) 07/16/87

14:30

SITE #2

Sample Locations #11-#14

Samples Collected:

SOILS:

TB-13 (1-2 ft. depth)--Black Foundry Waste 07/22/87 11:00

TB-14 (1-2 ft. depth)--Red Sludge 16:15 07/23/87

MONITOR WELL & CAMPA RAY LOGS

V P P R N D I X P

PROJECT NAME: WIXOM (FORD ASSEMBLY PLANT)

PROJECT NAME: WIXOM (FCF SECLOGIST: D. MONET TOWN: 2 N RANGE: B E SECTION: 7 FRACTION:		COUNTY: OAKLAND		INST	TOR WELL ALLATION ISHIP:	#: 1 DATE: 06/24/37
_DRILLING DATA		***				
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fluid:	from:	to:	Size:	fr	oa:	te:
fluic:	from:	to:	siza:	fr	08:	to:
•						
MONITOR WELL DESCRIPTION						
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Screen point; Perforation			; Pipe S	ections; Leng	ith: 18 FT	Number: 2
Screen sections;	,,, 3.PE	Tongens E :		Leng	th:	Nusber:
Perforation size: # 7			į			Number: Number:
Perforation size: # 7		h: Number:		•		
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Top of Protective Pipe	į					į
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Screen Tip	37 F	T BELOW SRADE				
; Bottom of Borehole	78 F	T BELOW GRADE				
SWL after installation	14,4	FT BELOW GRADE			·	
SOREHOLE FILL MATERIALS		COAM - TO	i can		50	
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Bentanite	γ	14 FTB6 - 2 FTB6	:			
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Gravel	N				·	
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WAS THE MONITOR WELL DEVE METHOD OF DEVELOPMENT?		-	<u> </u>	N] 	,
REMARKS - FIBB = FEET BEL CEMENT EMPLACED AROUND C			BLE SURFACE			

PROJECT NAME: WIXON (FORD ASSEMBLY PLANT)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7

FRACTION: SW 1/4 NE 1/4

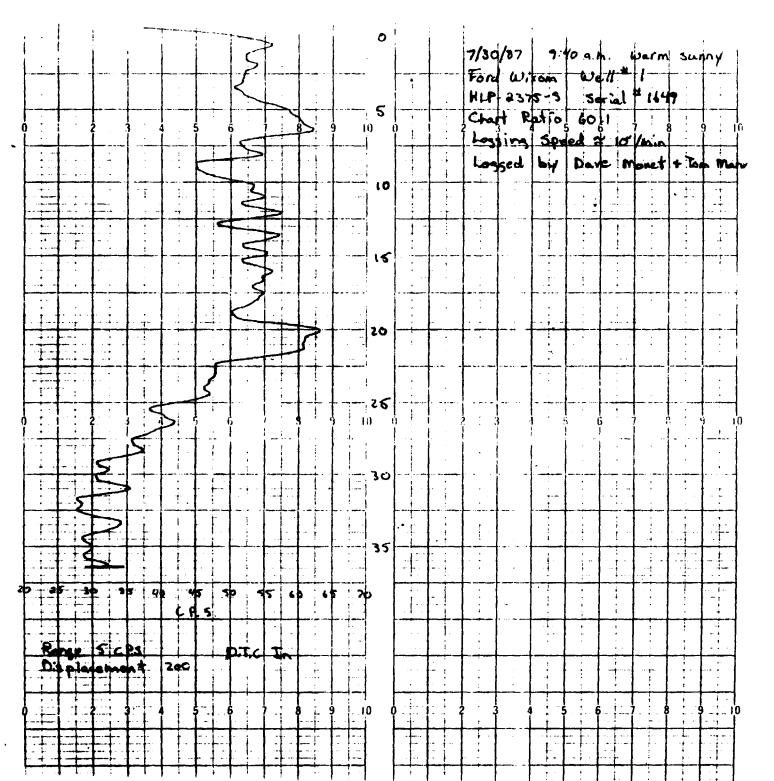
MONITOR WELL #: 1 SOIL BORING #: SEOLOGIST: D. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 06/24/87

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					11		brey clay (dry) (increasing sand content w/depth)	
				ift op de roman de mir op op de roman	19		Clay soft)	
							Sandy grey clay	
					30			
	ė 5 j j 5 j 1 L ė L		事: 65 者: 長: (40 kg) 3 - (50 音·長)			3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Grey silty very fine sand (saturated) (some coarse sand grain zones)	
					28	E.O.S.		
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MUNITOR WELL INSTALLATION SHEET

PROJECT NAME: WIXOM (FORT GEDLOBIST: D. MONET TOWN: 2 N RANGE: S E SECTION: 7 FRACTION: !	EW 1/4	COUNTY: DAKLAND NE 1/4		MONITOR WEL INSTALLATIO TOWNSHIP:	L #: 2
ORILLING DATA					
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•	roe: Froe:	ta:	91281 5128:	fre a:	
Y.U.U.	/: OM:	to:	5128; 	from:	to:
MONITOR WELL DESCRIPTION } Screen Type: STAINLESS S	TEEL WIR	E WOUND	Casing Pi	pe Material: SAL	VANIZED STEEL
Diameter of perforated si	ection:	2 INCH	Pice Diam	eters; 0.D.:	1.0.+ 2 tu
Perforation Type: slots	: X h	oles: screen:	Pipe Sect	ions;	
Screen point; Perforation	n size:	#7 Length: 2 FT		ions; Langth: 18 Langth: 9	r: Number: 1
{ Screen sections;				Length: 7	r Number: : Number:
Perforation size: # 7	Length	: 2 FT Number: 2		Length:	Numbers
Perforation size: # 7 Total perforated length:		: Number:	*nisina #	ethods: GALVANII	
; butar perforated length:			verming d	ethops: JHLVANII	<u> </u>
PROTECTION SYSTEM Casing protective pipe In Protective pipe C.C.:	engtn:		utaer pro	tection: Lugkin	5 CAF
;					
_ WELL CONSTRUCTION DATA	.				
WELL CONSTRUCTION DATA_	DISTA	NCE ABOVE/BELOW SEDUN	O SURFACE !		
Top of Casing Pipe	2 FT	+/- ABOVE BRADE			
Top of Protective Pipe		~~~~~			
Perforated Section	25 FT	- 31 FT BELOW GRADE			
Screen Tip	}				
Bottom of Borehole	}				
SWL after installation		FEET BELOW GRADE			
EBBEID F. St					
BOREHOLE FILL MATERIALS_	1 4/4 1	SONW _ TO		70	220M - 79
•	, ,		= =====================================		
Graut/Slurry	11				
Bentonite		11 FTBG - GROUND	; -:		
	N		<u> </u>		
Gravel	N			:	
TYPE OF GROUT USED: BENTO	NITE SLU				FTER
WAS THE MONITOR WELL DEVEL METHOD OF DEVELOPMENT ?	OPED AF	ER INSTALLATION ?	YES	X NO	
REMARKS FIBS = FEET BELD PLACED I - 4x4 WOOD POSTS	W GRADE ARCUND	WELL FOR PROTECTION	ABLE SURFACE		

PROJECT NAME: WIXDM (FORD ASSEMBLY PLANT)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7

FRACTION: SW 1/4 NE 1/4

MONITOR WELL #: 2 SOIL BORING #:

SECLOSIST: 0. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 06/26/87

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elev teet	54 8 p	type	depth	blows	depth	profile	description	ie!
							Brown loamy clay sand	
			!	; ;	6.5		sandy zone	
:				f ! !	8		Grey clay (acist) (saturated grey clay sand & 10 - 16.5 ft)	
					10.5		Grey soft clay (sandy clay zone @ 20.5 - 22 ft)	
					23		Alternating thin lenses of grey clay, sand, and silt	
				- 4 - 5 - 5 - 15 - 15 - 15 - 15 - 15 - 1	31	E.J.B.	•	
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ENDYTON WEFF TRSIMEFULTED TON OUEST

WN: 2 N RANSE: 8 CTION: 7 FRACTION:	E				HELL #: 3 ATION DATE: P:	
DRILLING DATA	ON STEM	AUGER	Type of Casing	Bit: CARBIDE size;	TEETH	
fluid: fluid:	from: from:	to: to:		froa: froa:		
MONITOR WELL DESCRIPTION	IN		` 			
Screen Type: STAINLESS			Casing	Pipe Material:	BALVANIZED	STEEL
Diameter of perforated			Pipe Di	ameters; 0.0.	: I.D.	: 2 II
Perforation Type; slot	S: X i	noles: screen:	Pipe Se	ctions; Langth:	0 FT No.	
Screen point; Perforati	on size:	#7 Length: 2 FT	į	Length:	4.5 FT Num	ber:
Screen sections;			:	•		ber:
Perforation size: # 7				Length:		ber:
Ferforation size: # 7 Total perforated length		: Numper:	Joining	Methods: GALY		TNEC
PROTECTION SYSTEM						
Casing protectl a pipe Protective pipe 0.3.:	Ţ		•	rotection: LO	LKING CAP	
Too of Casing Pipe	J FT	+/- ABOVE GRADE	1			
Top of Protective Pipe	Ì					
		FT 19.5 FT BELOW GRAD	Œ			
Perforated Section	13.5	FT 19.5 FT BELOW GRAD	E			
Perforated Section Screen Tip	13.5)E			
Top of Protective Pipe Perforated Section Screen Tip Bottom of Borehole SWL after installation	13.5 19.5 29 F	FT BELOW SRADE	JE .			
Perforated Section Screen Tip Bottom of Borehole	13.5 19.5 20 F	FT BELOW SRADE T BELOW GRADE T SELOW GRADE				
Perforated Section Screen Tip Bottom of Borshole SWL after installation	13.5 19.5 20 Fi	FT BELOW SRADE T BELOW GRADE T SELOW GRADE)E	- ro	FROM - T	
Perforated Section Screen Tip Bottom of Borshole SWL after installation	13.5 19.5 20 F	FT BELOW SRADE T BELOW GRADE T SELOW GRADE		- IC	FROM - T	
Ferforated Section Screen Tip Bottom of Borahole SWL after installation BOREHOLE FILL MATERIALS	13.5 19.5 20 F	FT BELOW SRADE T BELOW GRADE FT SELOW GRADE FROM - TO 9 FTB6 - 2 FTB6		- IC	FROM - T	
Perforated Section Screen Tip Bottom of Borehole SWL after installation BOREHOLE FILL MATERIALS Srout/Slurry	13.5 19.5 20 F	FT BELOW SRADE T BELOW GRADE FT SELOW GRADE FROM - TO 9 FTB6 - 2 FTB6		- TC	FROM	
Ferforated Section Screen Tip Bottom of Borahole GWL after installation BOREHOLE FILL MATERIALS Srout/Siurry Bentonite	13.5 19.5 20 F) 9.3 /	FT BELOW SRADE T BELOW GRADE FT SELOW GRADE FROM - TO 9 FTB6 - 2 FTB6		- TC	FROM T	
Perforated Section Screen Tip Bottom of Borahole SWL after installation BOREHOLE FILL MATERIALS Srout/Slurry Bentonite Sand	13.5 19.5 20 F7 9.7	FT BELOW SRADE T BELOW GRADE FROM - TO 9 FTB6 - 2 FTB6 9 FTB6 - 2 FTB6	FROM			0

PROJECT NAME: WIXON (FORD ASSEMBLY PLANT)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7 FRACTION: SW 1/4 NE 1/4

MONITOR WELL 4: 3 SOIL BORING #: GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 06/30/87

ley eet	5 3.6 0	ş an ç type	Samo depth	Diaws	deeth	profile	description	field test
					1		Loamy top soil	
!					2		Brown medium loamy sand	
							Brown clay loam (moist)	
,					7		Brown sandy loam (moist)	
					12		Grey clay (stiff & dry)	
						2 0 0 1	Sney gravelly sand (saturated)	
					15.5		clay lens	
					16.5 17.5	3	grev sand (saturated)	
						E.O.P.	clay lans	
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MONITOR WELL INSTALLATION SHEET

PROJECT NAME: WIXOM (FOR BEDLOGIST: D. MONET TOWN: 2 N RANGE: B E SECTION: 7 FRACTION:		COUNTY: CARLAND		INE"	ITOR WELL ! TALLATION ! HSHIP:	H: 45
_DRILLING DATA		****				
Orilling Method: HOLLO Drilling Fluids:	IN STEM	AUGER		of Bit: CARI ; size;	SIDE TEETH	
•	from:	to:	•	· · · · · · · · · · · · · · · · · · ·	ou:	to:
fluid:	fra a:	to:	1	fi		to:
****************		*****				
MONITOR WELL DESCRIPTION					*	
Screen Type: STAINLESS S Dismeter of perforated s			Casin	Pipe Mater:	ial: EALVAI	NIZED STEEL
Perforation Type; slots			Pipe !	liameters; ().D.:	I.D.: 2 IN
Screen point; Perforation	n eitar	#7 Langth: 2 FT	Pipe	Sections; Len	gth: 9 FT	Number: 1
Screen sections;	W 31661	at rendering to	1	Len	ith: 3 FT	Number: i
Perforation size: # 7			į		ith:	
Perforation size: # 7		h: Number:	1		-	
Total perforated length:	2 P!			ig Metnoos: (SUCAULTED	LUUPLINGS
PROTECTION SYSTEM Casing protective pipe 1			Dinar	protection:	: DEVINE	^^D
Protective pipe 0.0.:	engena		other	h.arstrinu:	TOCKING (AL
. WELL CONSTRUCTION DATA_						
	DIST	ANCE ABOVE/BELOW GROUN	D SURFACE			
Top of Casing Pipe		+/- ABOVE GRADE	************			

Top of Protective Pipe						
Perforated Section	9 F	T - 11 FT BELOW SRADE				
Screen Tip	11 F	T BELOW SRADE				
Bottom of Borehole	12 F	T BELOW GRADE				
GWL after installation	5.4	FEET BELOW GRADE				
	. } ======		*****			
BOREHOLE FILL MATERIALS	Y/N	FROM - TO	FRO	1 - 70	. FR	OM - TO
Brout/Slurry			;;======= ; ;			
Sertonite	y	8 FTB6 - 2 FTB9				
Sand		12 FTB6 - 6 FT26		~~~~~~~	}	
arayel	N					*****
. 2/ 3/ 3/						
TYPE OF GROUT USED: <u>BENT</u>	DNITE BL	LRRY	WEIGHT BEF	ORE	AFTI	ER
WAS THE MONITOR WELL DEVEL METHOD OF DEVELOPMENT ?	OPED AF	TER INSTALLATION ?	989	X N	0	
REMARKS FIRS = FEET BELL	N GRADE	W.T. = WATER TA	BLE SURFACE			*******
CEMENT PLACED AROUND CAS						

PROJECT NAME: WIXON (FORD ASSEMBLY PLANT)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7 FRACTION: SW 1/4 NE 1/4

MONITOR WELL 4: 45
SOIL BORING 4:
BEDLOGIST: D. MONEY

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/01/87

eley feet	5385	samp type	gaep depth	blows	deoth feet	profile	description	field
							Black top soil (clayey)	
				•	5.5 6		Grey clay	
						ξ ξ ξ	Brown silty clay (soft & moist)	
	1				10 12	E.O.B.	Brown stity sand (saturated)	
					1			
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MONITOR WELL INSTALLATION SHEET

PROJECT NAME: WIXEM (FOR SEOLOGIST: D. MONET TOWN: 2 N RANGE: B E SECTION: 7 FRACTION: S		COUNTY: GAKLAND		INST	TOR WELL TALLATION : ISHIP:	*: 40 <i>*</i> DATE: 06/30/0
DRILLING DATA		******		*=======		
Drilling Method: HOLLO Drilling Fluids;	N STEM	AUSER	Type of Casing	Bit: CARE size;	NTE TEETH	
	from: from:	to: to:	:	fr fr		
			·			
MONITOR WELL DESCRIPTION Screen Type: STAINLESS S		DE MONIO	Pasing	Pina Matari	1 - EAI UA	NIZED STEEL
Diameter of perforated s			į			I.D.: 2 IN
Parforation Type: slots			Pige Se	amerers; o ctions:		Number: 1
Screen point; Perforation	size:	#7 Length: 2 FT	·	'Leng Leng	ith: 18 f! ith: 4.5 f	Number: 1 Number: 1
Screen sections; Perforation size: # 7						Number: 1
Perforation size: # 7				Leng	thi	HUMBET!
Total perforated length:			Jaining	Methoos: 8	ALVANIZED	COUPLINGS
1	ength: 		Other p	rotection:		CAP
WELL CONSTRUCTION DATA		SOCONTOR TOP OF CONTROL				
	,	ANCE ABOVE/BELCH GROUN	SUMPACE :	=======================================		
Top of Casing Pipe	3 F1	+/- APOVE GRADE				
Top of Protective Pipe						***
Perforated Section	22 F	T - 28 FT BELOW GRADE				
Screen Tip	2 9 F	T BELOW GRADS				
Bottom of Borehole	29 F	T BELON GRADE				
SWL after installation	5.7	FEET BELOW GRADE				
. POREMOLE FILL MATERIALS						
	/N	FROM - TO	KOC3	- 70	FR	DM - TO
Srout/Slurry	γ	21 FTB6 - 2 FTB9		ļ		
Bentonite	Y	21 FTBS - 2 FTBS				
Sand	N					
Grivel	N		• •	; ;		
TYPE OF GROUT USED: BENTO	NITE SL	URRY	WEIGHT BEFOR	E	AFT	ER
WAS THE MONITOR WELL DEVEL METHOD OF DEVELOPMENT?	CPED AF	TER INSTALLATION 7	723	X NO		
REMARKS FIBS = FEET BELD COMENT PLACED AROUND CASI			PLE GIBETUE			

PROJECT NAME: NIXON (FORD ASSEMBLY PLANT)

COUNTY: CAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7 FRACTION: SW 1/4 NE 1/4

MONITOR WELL #: 40 SOIL BORING #: SECLOSIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUBER

COMPLETION DATE: 06/30/87

	no.	₹ÿpE	depth	blows	death	profile	description	field test
							Black top soil (clayey)	
1			1 1 1		5.5	1415419 0 78	Grey clay	
	1						Brown silty clay (soft & moist)	
		!	<u> </u>		10	3,3,2,5	Brown silty sand (saturated)	
į			ļ	; }	11.5	[3][3][3	Brown silty clay	
							Srey silty clay (firm) idrier w/depth)	
		\ } }	i i i		21	6 3 = 6 6	Gray sandy gravel	
				! ! !	23		Sney sandy clay (wet)	
			rati den der der der den den den den der		25	EN L	Srey sandy gravel and clay lenses (saturated)	
	•	r 1 1 1	{		29	E.O.B.		
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1 1 1	} \ }		1	1) !			
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7/30/37 3/10 pm. sunny warm Wixam Wall# Ratio 60: ! Speed to frein han Mark Dave 0 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 Ď 10 ! . ्। क 5€ 25

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MUNITUR WELL INSTALLATION SHEET

OLOGIST: D. MONET WN: 2 N RANGE: B CTION: 7 FRACTION:	Ε				. #: 5
ORILLING DATA	DN STEN I	AUGER	Type of Bit: Casing size;		TH
	from	to:	sizei		to:
fluid:	from:	te:	Silei	from:	ts:
MONITOR WELL DESCRIPTION Screen Type: STAINLESS Diameter of perforated Perforation Type; slot Screen point; Perforations;	STEEL WII section: s: X }	2 INCH noles: screen:	Casing Pipe N Pipe Diameter Pipe Sections	rs; 9.D.: !!Length: 9	I.D.: 2 I
Perforation size: # 7	Lengti	n: 2 FT Number: 2	•	Length:	
Perforation size: # 7	Lengti		,	Length:	
Total perforated length	: 6 FI		: Joining Metho	ods: GALVANIZ	ED COUPLINGS
WELL CONSTRUCTION DATA		NAME ADDIE (DE DE DA SEASIN			
Tom of Casing Pipe			D 50M-ACE ====================================	:::::::::::::::::::::::::::::::::::::::	
		updar jugar			
Top of Protective Pige	·	•••••			
Perforated Section	11.5	FT - 17.5 FT BELOW GR	ADE		
Screen Tip	17.5	FT BELOW SRADE	, }		
Bottom of Borehole	24 F	T BELOW GRADE			
B.H	8.6	FEET BELOW GRADE			
SWL after installation		*			
BOREHOLE FILL MATERIALS		FROM - TO	FROM - 70		ROM - TO
BOREHOLE FILL MATERIALS	- Y/N		FROM - 10		ROM - TO
BOREHOLE FILL MATERIALS Srout/Slurry	Y		FROM - TC		ROM - TO
BOREHOLE FILL MATERIALS Srout/Slurry	Y	9.5 FT86 - 2 FT86	FROM - 10		R9M - TQ
BOREHOLE FILL MATERIALS Srout/Slurry	Y Y	9.5 FT86 - 2 FT86	FROM - 75		R2M - TO
BOREHOLE FILL MATERIALS Srout/Slurry	Y Y N	9.5 FTB6 - 2 FTB6 9.5 FTB6 - 2 FTB9			
BOREHOLE FILL MATERIALS Srout/Slurry	Y Y Y N N N N N N N N N N N N N N N N N	9.5 FTB6 - 2 FTB6 9.5 FTB6 - 2 FTB9	WEISHT BEFORE	A	

PROJECT NAME: WIXOR (FORD ASSEMBLY PLANT)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7 FRACTION: SN 1/4 NE 1/4

. MONITOR WELL 4: 5 SOIL BORING : SEDLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/17/87

eley teet	Saep no.	type	Sago depth	blows	dest h	profile	description	i e i
		! !			2 5		Brown sand	
					2.5		Brown silty clay loam (very compact & hard drilling)	
	<i>;</i> }		; } !	; ; ;	6.5	\$11.51.51 \$11.51.71	Brey silty loam	
	, , , ,	/ 	<i>I</i>		8.5 9.5	3 136 5	Brey sandy, silty loam (moist & easy drilling)	
						A THE RESTRICT	Grey silty gravel (saturated) (very fluid)	
					17		Grey slite clay	
		6 6 1 1		1	24	E.O.B.		
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		; }		•				
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MONITOR WELL INSTALLATION SHEET

MONITOR WELL #: 68 '
INSTALLATION DATE: 07/17/27

PROJECT NAME: #IXOM (FORD ASSEMBLY PLANT)

GEDLOGIST: D. MONET

TOWN: 2 N RANGE: 9 SECTION: 7 FRACTION:		: DAKLAND		TOWNSHIP:	
DRILLING DATA Drilling Method: HOLL Drilling Fluids;	OW STEM NUGER		Type of Bi Casing siz	t: CARBIDE TE	ETH
fluid:	from: to	:	S129;	froat	to:
fluio:	from: to	•	size:	from:	to:
MONITOR WELL DESCRIPTION Screen Type: STAINLESS Diameter of perforated Perforation Type; slot	STEEL WIRE WOUND section: 2 INCH		Pipe Disee	ters; O.D.:	LVANIZED STEEL
			Pipe Secti	ons;Length: 9	FT Number: 1
Screen point; Perforati	on size: #7 L	ength: 2 FT	1	Length: 3	FT Number: 1
Screen sections; Perforation size: # 7	i acaib.	W1	į	Length:	
Perforation size: # 7		Number: Number:	i I	Length:	Number:
Total perforated length		Admost .) Jainina Me	chods: GALVĀNI	ZED COUPLINGS
PROTECTION SYSTEM Casing protective pipe Protective pipe 0.0.:	length:	~~~~~	Staer prot	ection: LOCKI	NG CAP
WELL CONSTRUCTION DATA	3 FT +/- ARDV	E/BELOW GROUND E GRADE	SURFACE		
Top of Protective Pipe	-				
Perforated Section	8.5 FT - 10.5	FEET BELOW SA	ADE		
Screen Tio	10.5 FEET BEL	ON GRADE			· · · · · · · · · · · · · · · · · · ·
Bottom of Screhole	14 FT BELOW S	RADE			
SWL after installation	7.2 FEET BELO	W GRADE			
BOREHOLE FILL MATERIALS	 Y/N	OM - 70	FROM . T	0 1	FROM - TO
Grout/Slarry	1 '	6 - 2 5786			
Bentonite	Y 7 FTE	6 - 2 FTBS			
Sand	N				
Sravel	N				
TYPE OF GROUT USED: BEN I	ONITE SLURRY			·	AFTER
WAS THE MONITOR WELL DEVE METHOD OF CEVELOPMENT ?	LOPED AFTER INSTA	LLATION ?	YES	X NO	
REMARKS ETBG = FEET BEL DEMENT FLACED AROUND CAS	ON GRADE 4.	T. = WATER TAE GRADE	BLE SURFACE		

COUNTY: OAKLAND

TOWN: 2 N RANGE: 8 E
TOWNSHIP:
SECTION: 7 FRACTION: SW 1/4 NE 1/4

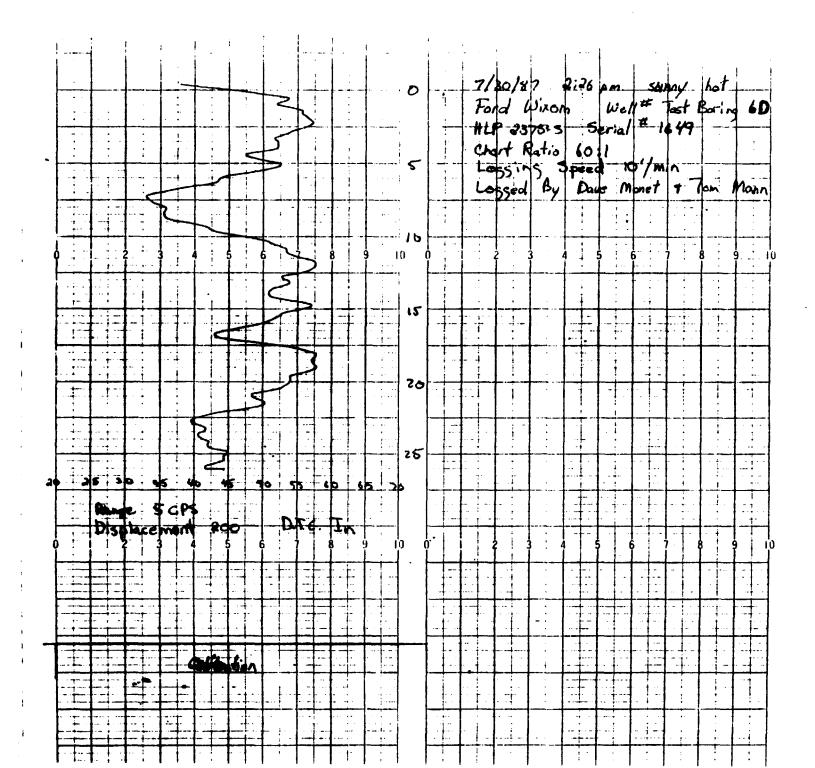
MONITOR WELL #: 65 SOIL BORING #: SEOLOGIST: D. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/17/87

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eley eet	saep no.	type	5200h	blows	death Fact	profile	description	fiel
		٠					Black top soil (clayey)	
			1 1 1		4.5	34341	Grey silty clay	
					***	\$ \$ \$ \$ \$ \$ \$ \$	Grey silty gravel (saturated)	
							Brown & grey silty clay	
					21.5	E.O.B.	Grey silty loam	
			T gan tige to the fact that the tige when the					



MUNITUR WELL INSTALLATION SHEET

GEOLOGIST: D. MCNET TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: S				IN	NITOR WELL ISTALLATION WNSHIP:	#: 7
ORILLING DATA Drilling Method: HOLLOW Drilling Fluids;	STEM	AUGER		f Bit: CA	RBIDE TEET	H
:	ron: ron:	to: to:			from: from:	to: ::
MONITOR WELL DESCRIPTION Screen Type: STAINLESS ST	EEL WI		Casing	Pipe Mate	rial: BALV	ANIZED STEEL
Diameter of perforated se Perforation Type; slots: Screen point; Perforation	X	holes: screen:	Pipe D Pipe S	ections;Le	ngth: 18 F	I.D.: 2 IN T Number: 1 Number:
Screen sections; Perforation size: # 7 Perforation size: # 7 Total perforated length:	Lengt Lengt	h: 2 FT Number: 1	lainin	i.e Le	ingth: ingth:	Number: Number: Number: D COUPLINGS
· :				-	ONLYMAILE	
PROTECTION SYSTEM Casing protective pipe 1s Protective pipe C.D.:	ingth:		Other		: LUCKING	CAP
-WELL CONSTRUCTION DATA		ANCE ABOVE/BELOW GROUND				
Too of Casing Pipe		F +/- ABOVE GRALE				
Top of Protective Pipe						~~~~~~~~
Perforated Section	15 (FT - 19 FT BELOW GRADE				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Screen Tip	19	T BELOW GRADE				
Sottom of Borehole	25 /	T BELOW GRADE				
SWL after installation	11.6					
+ BOREHOLE FILL MATERIALS						
Grout/Elurry						
Bentonite	γ	11 FTBG - GROUND				
Sand	Y	19 FTBG - 14 FTBG				***
Sravel	N	*******************************				
TYPE OF GROUT USED: BENTO	IITE S		•			
WAS THE MONITOR WELL DEVELOR METHOD OF DEVELOPMENT?	IPED A	FTER INSTALLATION ?	YES	X	NO	
REMARKS FIEG = FEET BELO	SRADI	N.T. = WATER TA	BLE SURFACE			

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 9 E

TOWNSHIP:

SECTION: 7 FRACTION: SN 1/4 NE 1/4

MONITOR WELL #: 7

SOIL BORING #: GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/21/97

eley	Samp	Sage Lype	depth	biows	degth	profile	description	[ield
						51.548.1° 51.548.1°	Brown silt loam	
[2.5		Dark brown silt loam	
<u> </u>					5.5 6.5	80000	Stones	
) } }				9		Brown clay (moist & friable)	
							Brown fine sand (moist)	
	*				12.5	0.0	Grey pebbly medium sand (moist)	
	1		 		15.5 17		Brown very coarse gravelly sand (saturated)	
					18		clay lens Brey coarse sand (saturated)	
					19	1. 2 2	Grey silty sand (saturated)	
					25 26	\$\[\frac{1}{2}\]\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Grey silty, loamy clay	
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MONITOR WELL INSTALLATION SHEET

PROJECT NAME: WIXOM (FOR: BEOLOGIST: D. MGNET TOWN: 2 N RANGE: B E BECTION: 7 FRACTION: !		COUNTY: DAKLAND		INST	ITOR WELL # TALLATION DI NSHIP:	: 8
DRILLING DATA Drilling Method: HOLLO Drilling Fluids;	STEM	AUGER		of Bit: CARI g size;	DIDE TEETH	
fluid:	rga:	to: to:		fr fr		to: to:
MONITOR WELL DESCRIPTION Screen Type: STAINLESS S Diameter of perforated s Perforation Type; slots Screen point; Perforation Screen sections; Perforation size: # 7 Perforation size: # 7 Total perforated length:	TEEL Wi ection: : X : size: Lengt Lengt	2 INCH holes: screen: 47 Length: 2 FT th: 2 FT Number: 1	Pipe S	Leng	J.D.: gth: 9 FT gth: 3 FT gth: gth:	I.D.: 2 IN Number: 1 Number: 2 Number: Number:
PROTECTION SYSTEM Lasing protective pipe 1 Protective pipe 0.0.:	ength:		Other	protection:	FOCKING C	AP
WELL CONSTRUCTION DATA_		ANCE ABOVE/BELOW GROUN	SURFACE			
Too of Casing Pipe	•					
Top of Protective Pipe						
Perforated Section	11.	S FT - 15.5 FEET BELOW	ERADE			
Screen Tip	:5.	5 FT BELOW SRADE				
Bottom of Borehole	16	FT BELOW SRADE				
SWL after installation	5.8	FEET BELOW SRADE				
: BOREHOLE FILL MATERIALS_						
			F201	- TG	FRO	1 - TO
Grout/Slurry			<u> </u>			
Bentonite	Y	11 FTBG - GROUND				
Sand	N		! ! !			
Gravel	N		i :			
TYPE OF GROUT USED: BENTO WAS THE MONITOR WELL DEVEL METHOD OF DEVELOPMENT?	OPED A	URRY	WEISHT BEFO	IRE	AFTE	R

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

TOWNSHIP:

SECTION: 7 FRACTION: SW 1/4 NE 1/4

MONITOR WELL 9: 8 SOIL BORING 4: GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/21/87

eley feet	Samp NO.	Eype	sano depth	blows	denth feet	profile	description	field
					3		Black top soil	† 1 1
		<u> </u>	<u>i</u> ! !		3		Grey sandy Ioam (moist)	
		į		į !	6	\$1331X	Brown silty & clayey sand (saturated)	-
	1) - - - -	1	1 1 1	7		Brown silty clay (slightly sandy)	
							Brc*n sandy loa⊠ (moist & silty)	
					12.5	STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STATE OF STA	Grey silty sand (saturated)	
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APPENDIX C

SOIL BORING DATA

STATION: (X-2005, Y-2098)

COUNTY: CAKLAND

TOWN: 2 N

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING #: 1 GEOLOGIST: D. MONET DRILLER: W. ROGERS

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/01/87

sample nc.	sample type	l HNU reading 			description
		0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Brown coarse sand
 		 	! ! ! 4		***************************************
		 3 - 4	5		Black coarse sand (saturated)
1	soil	 	6.5	E.O.B.	Black sandy sludge (saturated)
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ŧ		11	(Y/N)	}	TYPE	(FEET)	11	BOREHOLE CUTTINGS (Y/N)	:	(FEET)	1
ŧ	DATA	;;		ţ	!		! !		1		
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STATION: (X-2002, Y-2102)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 2 GEOLOGIST: D. MONET DRILLER: W. ROBERS

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 97/01/87

1 1	sample no.	sample type	HNU reading	; depth	: profile	description
1	1		0	3		
1 1 1 1 1 1 1	 		i i i i			Brown clay
1		· 	3 - 4	-		Black sludge
1			: 	i 7 	E.O.B.	
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Į		:	f :	GROUT (Y/N)	:	GROUT Type	:	FROM -	- TO ()	1:	90	OREHOLE CUT	TINGS :	í	FROM -	TO)	:						*
ŧ	DATA	;	: :	¥	;	pentanite powder	!	7 -	1	; ;		¥	; !		1 -		į						
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STATION: (X-2168, Y-2158) COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 3 GEOLOGIST: D. MONET DRILLER: W. ROGERS

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/01/87

sample	sample	HNU	1	: :	
na.	type :	reading	depth	profile !	description
	' 		' }	0006	Rocky fill (stones)
;		0	1		8lack gravel (greasy texture)
i	i i		: -}		
!			5		Brown clay loam
	<u>:</u>	1 -	1		.,
•	, 	, ; , ,	, 0		Light brown clay loam
1	soil	;	† 	E.O.B.	(2 inch saturated brown silt lens & approx. 11 ft)
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	•		1	1 1	
	i	: 1 :	:5 	1 1	
	! !	;	:	! ! ! !	
		}	; ;	; ;	
	i :	 	!	1 1	
	:	! ;	<u>:</u>	1 1	•
	i	. 2	20	1	

ŧ		11 GROUT	SROUT TYPE	FROM - TO 11 (FEET) 11	BOREHOLE CUTTINGS !	FROM - TO (FEET)	
ŧ	DATA	; ;	1	11	¥		}
ŧ		11	i i	11	!		

STATION: (X-2038, Y-2112)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: BE

SECTION: 7

FRACTION: SW 1/4 NE 1/4

SOIL BORING #: 4 GEOLOGIST: D. MONET DRILLER: W. ROGERS

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/02/97

: sample : no.		HNU reading		i profile :	d es cription
		0	1		Brown clay loam
1	! !	! !	3	087.208 a	Gravel Brey clay !sas
1	 	25	5 5 1 1		Black sludge
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			t t t t t t t t t t t t t t t t t t t		Brown sandy clay loam
;		0 1	! 0 !		Brown & grey sottled clay
i 2	soil	()	* : : : : : : : : : : : : : : : : : : :		Grey & brown mostled clay
 3	soil	0 1	: : : :		Grey pebbly clay
1	soil	 	18.5	a 3	
		2		E.O.B.	

Ť		11	GROL (Y/)	IT I	GROUT !	FROM - TO (FEET)	: BOREHOLE CUTTIN	IBS ;	FROM - TO (FEET)	COMMENTS
;	DATA	11	N	:	;		; ; Y	!		Backfilled nole w/cuttings except for sludges.
ŧ		i i		i	i	;	i	i		•

STATION: (X-2183, Y-2102)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 5

GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/14/87

	: sample :	HNU reading	: death	! profile !	description
//U·	type i	remains	1	1	
			0.5	This is	Brown sandy loam
		i	;		Brown clay loss
	 	!	1		Dinami Frei inge
		· 	1	Hills	
i	soil !	•	1 3	1111111111	
	; !	i	3.5	RETTIPE	Brown sand
	; }		1		Brown sandy clay
4	soil		·5 5		
	! !	1 - 2	;		Blue-grey sandy clay (oily)
			. 6	HIAH -	
	i i !	! !	1 6.5	minin -	Blue-grey clay Brown medium sand (metal fragments in soil sample)
		•	1	mini	BI AMI BEAT OR STORE STORE STORE THE STORE STORESTED
	;	İ	; 9		Brey to white chalky clav (slightly fibrous)
	:		1	E.O.B.	
	i •		i .	i i	
	;	1	.0	1 1	
	!	}	!	1	
	:		1	!	
	1	.		1 1	
		i L	1	1 1	
	;	 	1	1	
	1	1	•	1 1	
		1 1	1	1 :	
	i !	i ! 1	i 5	i i	
	!	•	1		
	1	!	1	1	
	<u> </u>	! !	!		
	i !	i !	1	i i	
		1 i	· }		
	ì	1 i	;	1	
	!	;	1	1 1	
	i •	i !	; 20	i i	
	•	' !	:	1 1	

† †		11 (Y/N)	ì	TYPE	!	(FEET)	11	BOREHOLE CUTTINES (Y/N)		(FEET)	
ŧ	DATA	1 1 3 1		;		!		; ;		i		• • ·
				•		•						

STATION: (X-2079, Y-2085)

COUNTY: DAKLAND

TOWN: 2 N RANGÉ: 8 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SDIL BORING #: 6

GEOLOGIST: D. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/14/87

**********	122223221	***********	********	 \$48888	***************************************
: sample :		l HNU reading	l dankh	1	4: .h:
i 10. i	: type : !				·
		1	0.5	THE STATE OF	Brown sandy loam
1 /	1	!	1	000	
!	 	!	. 9	reservat	Brown sand & gravel
1	•	1	. 25	Hilliam	Aray candy riay inac
1 1	: soil	. 0	; 3		Grev sandy loam
	! 	!	1 3.5	10000000	Brown sand
		2.5	} # - 4.5	HIRM	Back and all and
2	soil !	!	5	HUNG	Brown pebbly clay
! !	; ;	1 0	5.5		
	}		t		
 	 soil	1 0	!	::::::::::::::::::::::::::::::::::::::	Brown clay
	. 3011	1	t *		
]!			. 8		
1 . 1	1	1			
4 1	/ SD11 /	1 0	1 0 5		Gray clay
 	;	·;1(.0 10		Reddish brown sandy clay (oily)
: :	1 1	1	!	://///////////////////////////////////	Grey clay (oily)
5 ;	i soil !	1 0	11	****	
i . !	i 		: :		Grey clay (soft)
1	<u> </u>	•	12.5		3) Ey Ligy .3011/
1 6 1	soil !	1 0	13		Grey sand (saturated)
1	!	•	1 14	-1	Solation (Solation & Automotion College)
!	, !			E.O.9.	
1 !	1	1 15		1	
: :	1	i	ł	1 1	
1	j	1	1	;	
1	!	!	1	1 ;	
;	į ,	1	!	1 !	
; ;	1 1	!	į	1 :	
} i		1	1	1 1	
i :	1 5 1	!	i !	<i>i</i> !	
1	•	1 20	Ų	1 1	
;	i!	}		,11,	

# # # :	'AMPI ETTAN	; !	(Y/N)	:	TYPE	ì	(FEET)	;;	BOREHOLE CUTTINGS (Y/N)	!	(FEET)	10 11
		11	Y	1	bentonite slurry	! !	14 - 9.5	11	¥	1		

STATION: (X-2086, Y-2131)

COUNTY: DAKLAND

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 7 GEOLOGIST: D. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/15/87

sample :	: sample		;	1 1	description
			1		Brown loas
		0 0 	; 2 ; ; ;		Brown clay loam (increasing clay content w/depth)
•		; ; ;	1		Black sandy sludge
:	} }	1	1 1 1 2 1		(reddish tint & 5 - 5.5 ft)
1	soil		-1 10.5		Blue-grey chalky clay (pebbly)
2	soil	•	11 11		,
		. 0	;		Grey & brown pebbly clay
;	soil	;	15 1 1		
		1		E.O.B.	
į	t : : : : : : : : : : : : : : : : : : :	!	1 8 2 1	1 1	
	,	; ; , ,	20 - ¹	1	
* * * *			* * * * * ROUT ! YPE :		11 BOREHOLE CUTTINGS : FROM - TO : : (Y/N) : (FEET) :

11 Y | powder & | 10 - 0 | 11 i sand !!

11

Y 16-10 !

* DATA :: | bentonite:

STATION: (X-2038, Y-2174)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

SECTION: 7

FRACTION: SW 1/4 NE 1/4

SOIL BORING 1: 8

GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGES

COMPLETION DATE: 07/15/87

	sample :	HNU reading		l profile !	description
414.	; type :	, secret	; ueptii		geatt thetail
			i i	1999	Brawn loam
	i :		1		
			i ! ! ! 5 5		Brown sandy clay loam
			;	13.311	
			1		Brown medium clay sand
			; 8 !	HAMILI	Brown sandy clay
1	soil	; ; ;	; 9 ; 0 ; 1 11		Brown pebbly clay
	;	1	;	E.D.B.	
	; ;) 	} !	! !	
	, :	' 	! !	, , i i	
	:	}	:	; ;	
		1 1	<u> </u>	i :	
		1	5		
	} :	<u>.</u>	1		
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	:	• :	;	; ;	
	:	! !	1	1	
	; !	; ;	; !	; ; ! !	
	!	}		. ,	
	!	! !	!		
	:	: 2	0 !	i !	

f t			6R00	JT : N) :	SROUT TYPE	1	FROM - TO (FEET)	11	BOREHOLE CUTTINGS (Y/N)	:	FROM - TO (FEET)	
# :	DATA	11	y	;	bentonite powder	1		!!		!		

STATION: (X-1959, Y-2077)

COUNTY: DAKLAND

TOWN: 2 N

RANGE: 8 E

SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL PORING #: 9 SEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/15/87

	sample type	HNU reading	-	profile	description
			; ;		Dark brown loamy gravel
			; 2 ; 3		Brown clay loam
1	soil		3.5		Black sludge
		i 	; 5 5 ;		Brown silty clay (saturated) Brown silty clay
		!	. 6		•••••••••••••••••••••••••••••••••••••••
2	soil	 	9 i 1 1		Brown-1 grey clay (stiff)
3	soil	0	• • • •		orome grey tray tatity
4	water	<u> </u>	0 10 ! !		Brown & grey medium sand (saturated)
			1 12	E.O.B.	
			: !	; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	
		1	: 5		
		 	1	! ! ! !	
;			! ! !	: : : :	
	 		!	!!!	
		! ! ! 2	; ; 0	; ; ; ;	
	!	!	!	1	

+		: :	ť,	Y/N)	1	TYPE	;	(FEET)	11	BOREHOLE CUTTINGS (Y/N)	1	(FEET)	
ŧ	DATA	11			ł	aentanite	!		11				
						•		12 - 0			!		; ; ;

STATION: (X-2216, Y-2278)

COUNTY: DAKLAND

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 10 GEOLOGIST: D. MONET

DRILLER: 5. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/16/97

	sample type	HNU reading	1		
		'	,	00000	Stones
1	50il		; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;		Black top soil and grave!
2	scil	<u> </u>	1 7		Brown silty clay
3		 0	; ; ; 9		Grey & brown mottled silty clay (1 inch +/- grey medium mand lens @ 8.75 ft)
		 1	1 0		Dark brown clay loam
	soil k	; ;	! 11 ! 12	IIII	Grey sandy Clay
	water	<u> </u>	1 12.5	The state of	Grey medium sand (saturated)
	soil	1	5	Y-7-	Brown clay (slightly silty)
		, 	17	E.O.B.	
:			1	1	
 		2	! 0 !		
* * * *	11	(Y/N) I TY	* * * * OUT :	FROM - TO (FEET)	
COMPLET DATA	4 11	bent Y slu	onite		

STATION: (X-1745,Y-1940)

COUNTY: DAKLAND

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SN 1/4 NE 1/4

SOIL BORING #: 11 GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/16/87

	sample type	HNU reading	: depth	 profile	description
		0	1		Brown grave!
i		0	: 2 :	0.1	Dark brown gravel
;		0	1 3 1 1 5 5		Brown clay loam
		0	1 1 1 1 1 1 1	47	Grey clay (silty)
		0	} ; ; 9		Light grey clay
,		0			Brown clay (soft)
		! ! ! !	;	E.O.B.	
			t : : : : :		
		 - -	t t		

*		11 (Y/N)	TYPE	(FEET)	11 BOREHOLE CUTTINGS 1 11 (Y/N)	(FEET)	
ŧ	ATAC	11	ţ	1	· · · · · · · · · · · · · · · · · · ·	!	
ż		11	1	1	11	;	

STATION: (X-1735, Y-1535)

COUNTY: DAKLAND

TOWN: 2 N

SECTION: 7

RANGE: 8 E FRACTION: SW 1/4 NE 1/4

SOIL PORING 4: 12 GEOLOGIST: D. MONET . DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/22/87

no.		HNU reading	; depth	; profile ;	description
) 	· '		Black top soil
;		0			Black sandy gravel
2 :	soil	! ! 0 !	!		Biack Sally Graves
	!	0	-5 5 -!		Brown clay
4		0	1 1 1 7.5		(brown & grey mottled clay @ 5 ft)
			-1 8		Brown & grey mottled clay
5		 	! : :		Brown clay
		, }	10.5		Brown medium sand (saturated)
;			; 11 ; ;	E.O.B. E.O.B. 	Brown clay
;		! !	! : :	! ! ! ! ! !	
i			1		
		i 1 i	1		
,	.	i !	i 1	i i	
:	!	!	: 20	1 1	
		· 		11	
+ + + +	: 1	(Y/N) I TY		(FEET)	
COMPLE' DATI)	t beni Y sl:		11 - 0	11 N

STATION: (X-1735, Y-1550)

COUNTY: DAKLAND

TOWN: 2 N RANGE: 9 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING #: 13 GEOLOGIST: D. MONET DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/22/87

sample :	sample type	: HNU reading	: depth 	; ; profile ; ;	
·	*******	'	' 1		Brawn top sai!
ł	soil		\$ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Black loam & sand (greasy) (molten pubbles mixed into soil)
	soil		1 4 1 5		Brown clay (decayed & rotted wood particles in matrix)
ţ	soil		6.5		Brown & grey mottled.mlay
4 :	soi!	; ; ;	1 1 1		(1 inch saturated-sand lens & 8 ft)
				E.O.B.	
		i !	; }	i i	
i	!	!		1 1	
;	!	<u> </u>	<u> </u>	! ! ! !	
1		! !	 	i i	
;		1 	5 !	! ;	
;	;	!	!	; ;	
		# :		· · · · · · · · · · · · · · · · · · ·	
:	1 1	; ; ;	•	1	
		i i			
	!	! ! 2	; 0	!	

# 1: SROUT # 1: (Y/N)	: GROUT : FROM - TO : TYPE : (FEET) :	BOREHOLE CUTTINGS FROM - TO (Y/N) (FEET)	1
# DATA :: # :: N		Y 10 - 0	

STATION: (X-1508, Y-2350)

COUNTY: DAKLAND

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SW 1/4 NE 1/4

SOIL BORING 4: 14 GEOLOGIST: D. MONET .

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/23/87

	: sample :		¦ depth	 profile : 	description
	: : : : : : : : : : : : : : : : : : :				Brown top sail
	i i		1 1.5	4341.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1	Bud attack to be desired as
	;			MHH	Red silty loam (cohesive) Brown sandy clay
1	soil :		; 2.3		Brown & grey eatiled clay
- -	}		:	1414	J. 541. 5 51 51 555 554 554 554 554 554 554 554
2	soil		5		Brey silty clay (stoney)
3	soil i		8		Black peat (roots, etc.)
4	 soil 	:	† 10 10		
			!		Grey fine clay sand (saturated)
	}			<u> </u>	
5	soil i			Jimmi	Grey coarse sand (saturated)
·	i i !!				Grey clay Grey & brown medium saturated sand 9 12.5 - 12.75 ft
!	· · · · · · · · · · · · · · · · · · ·		!	E.O.B.	Brown clay (dry) @ 12.75 - E.O.B.
	1		1	1 1	
		1	15	1 1	
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	i i		i !	i i !!!	
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	. 1 ! !	2	20	: :	
			_1	·	
					
* + + +	* * * * *	* * * * *	* * * *		
					11 BOREHOLE CUTTINGS 1 FROM - TO 1
COMPLET			/PE	(FEET)	11 (Y/N) ((FEET))
DATA		beni	•		11
un: r				13 - 0	
				v	

1 1

STATION: (X1668, Y-2100)

COUNTY: OAKLAND

TOWN: 2 N RANGE: 8 E SECTION: 7 FRACTION: SN 1/4 NE 1/4

SOIL BORING #: 15 GEOLOGIST: D. MONET

DRILLER: S. ECKLEY

DRILLING METHOD: HOLLOW STEM AUGER

COMPLETION DATE: 07/24/87

=========	*********	***********	1 7 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	********	
: sample :		: HMU reading	; depth	: profile	description
		· 		11	
1 1	<u> </u>	 :			Brown medium sand
1	 	; ! !	! ! ! ! 2		Brown loam
	soil	!	! !	p [9]	Brown & dark brown clay (decayed roots & wood in matrix)
; 		! !	1 4		Brown fine sand & silt mix
	soi!	! :	} 5		Dark brown clay
1 2 1	901.	; !	5.5		Brown sandy loam (dry)
!			: 6	: 11111:1511:	Brown & orey mottled clay
। ! र ।	soil	•	6.5		Dark brown clay loam
; 3 ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	3011	16		WY - WY - WY - WY - WY - WY - WY - WY -	Brown & grey mottled clay and silt
; ; ;		!			
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 }				! :	
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:: SROUT : GROUT : FROM - TO :: BOREHOLE CUTTINGS : FROM - TO :: IT (Y/N) TYPE ((FEET) I) (Y/N) I 'FEET) 41 1 1 11 11 Y 10 - 0 i n i ł
